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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/511,186	08/02/2005	Hiroyuki Itou	09792909-6005	1846

26263 7590 08/19/2009

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EXAMINER	
GREEN, TRACIE Y	

ART UNIT	PAPER NUMBER
2879	

MAIL DATE	DELIVERY MODE
08/19/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/511,186	ITOU ET AL.	
	Examiner	Art Unit	
	Tracie Green	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Receipt is acknowledged of applicant's amendment filed 05/05/2009. Claims 1-12 are pending and an action on the merits is as follows.

2. No amendments made, new grounds of rejection, this action is non-final.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 1, the applicant is claiming a structure of an electron emission film but recites process steps which do not indicate what the electron film as a structure should be. For example, claim 1 recites that emission film is composed of an ink and a carbon nanotube mixed with a heat decomposable compound. Does the electron film remain in ink form, does part of the heat decomposable compound remain as part of the carbon nantotube, or is only the carbon nanotube left as a layer. Claim 1 drawn to a device is replete with process steps, none of which clearly determine what the final product should be; as such this claim is rendered indefinite. Claims 2-9 are rejected based on their dependency status of claim

Claims 10, 11, and 12 recite similar recitations and are rendered indefinite for the same reason given for 1 above. For purposes of examination, the examiner will assume the following, claim 1 is drawn to an electron emission film with a surface roughness of 1500nm or less is composed of carbon nanotubes and residual components of a metal compound; claims 10-12 are drawn to electron emission devices wherein the electron film has a surface roughness of 1500nm or less is composed of carbon nanotubes and residual components of a metal compound.

5. Claims 2-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, claims 2-9 are drawn to what is an intermediate step in forming the final layer of the electron film. For purpose of examination, the examiner will assume the following : claim 2, the electron film has residual component of an organo-metallic compound, claim 3 the electron film has residual component of an metal salt, claim 4 the electron film has residual component of an organo-metallic salt, claim 5 the electron film has residual component of an organo-metallic complex, claim 6 the electron film has residual components of at least two metals, Claim 7 the electron film has residual components of at the metals Sn and one metal of In or Sb. Office action on merits follows.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-5 and 9-12 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Amey, Jr. et al. (US 6,409,567) in view of Debe (US 5,726,524).

Regarding claim 1, Amey, Jr. et al. (Amey, hereafter) teaches a field electron emission film (column 4, lines 60-65) on an electrode substrate, said field electron emission film comprising: an electron film wherein a carbon nanotube structural body of 0.001 to 40% by weight (Column 7, lines 30-35) and a heat-decomposable metal compound dispersed therein (Column 7, lines 30-35) *(Prior art reveals, Column 7, lines 5-15, reveal acetates which can be used and Column 60-65 illustrate ethyl groups which can be use, applicants attentions if further drawn to pages 15 and 16 of the applicants disclosure that discloses the various compounds which are named in this reference).*

wherein, said ink is coated and sintered on said surface of said electron substrate, said heat-decomposable metal compound in said ink is decomposed to a heat decomposition product by sintering said heat decomposition product having an adhesive characteristic imparted by said sintering, (Examiner note: this portion of the claim is drawn to a process of coating the emission film onto a substrate and does not delineate any further structural limitations beyond which has been claimed, this portion of the claim will not be afforded patentable weight.

Amey is silent regarding said field electron film has a surface roughness of 1500nm or less.

In the same field of endeavor of field emission devices, Debe teaches wherein said field electron film has a surface roughness of 1500nm or less (Column 2, lines 65-Column 3, lines 3 and Column 4, lines 15-25) *(Examiner note: surface roughness deal with peak to valley values, as the electron film is over the entire cathode, Deb teaches the microstructures not be 500nm or more therefore this limitation is met)* in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed (Column 6, lines 5-11).

Therefore one of ordinary skill in the art at the time of the invention, could modify the field electron device of Amey wherein said field electron film has a surface roughness of 1500nm or less in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed as taught by Debe.

Regarding claim 2, Amey teaches where said heat-decomposable metal compound is an organo-metallic compound (Column 7, lines 10-20).

Regarding Claims 3, Amey teaches wherein said heat-decomposable metal compound is metal salt (Column 7, lines 5-10)

Regarding Claims 4, Amey teaches wherein said heat-decomposable metal compound is an organo-metallic salt compound (Column 7, lines 5-10)

Regarding Claims 5, Amey teaches said heat-decomposable metal compound is metal complex. (Column 7, lines 10-20)

Regarding Claims 9, Amey teaches the thickness of said field electron emission film is 0.05 .mu.m to 20 .mu.m. (Column 8, lines 1-5)

Regarding claim 10, Amey teaches (Figure 16) a field emission electrode of a two pole type comprising: a cathode (2) on said support (3) and

a field electron emission film (1) on said cathode (2), wherein the electron film comprises a carbon nanotube structural body of 0.001 to 40% by weight (Column 7, lines 30-35) and a heat-decomposable metal compound dispersed therein (Column 7, lines 30-35) *(Prior art reveals, Column 7, lines 5-15, reveal acetates which can be used and Column 60-65 illustrate ethyl groups which can be use, applicants attentions if further drawn to pages 15 and 16 of the applicants disclosure that discloses the various compounds which are named in this reference).*

wherein, said ink is coated and sintered on said surface of said electron substrate, said heat-decomposable metal compound in said ink is decomposed to a heat decomposition product by sintering said heat decomposition product having an adhesive characteristic imparted by said sintering, (Examiner note: this portion of the claim is drawn to a process of coating the emission film onto a substrate and does not delineate any further structural limitations beyond which has been claimed, this portion of the claim will not be afforded patentable weight.

Amey is silent regarding said field electron film has a surface roughness of 1500nm or less.

In the same field of endeavor of field emission devices, Debe teaches wherein said field electron film has a surface roughness of 1500nm or less (Column 2, lines 65-Column 3, lines 3 and Column 4, lines 15-25) *(Examiner note: surface roughness deal with peak to valley values, as the electron film is over the entire cathode, Deb teaches the microstructures not be 500nm or more therefore this limitation is met)* in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed (Column 6, lines 5-11).

Therefore one of ordinary skill in the art at the time of the invention, could modify the field electron device of Amey wherein said field electron film has a surface roughness of 1500nm or less in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed as taught by Debe.

Regarding claim 11, Amey teaches (Figure 16) a field electron emission electron of 3-pole type, comprising: a cathode (2), an insulating film (4), and a gate electrode (5) sequentially formed on a support (3) ; a cathode (2) on said support (3); an insulating film (4) on said cathode (2); a gate electrode (5) on said insulating film (4); an first opening formed in common in the in said gate electrode (5); a second opening in

said insulating film (4) and the gate electrode(5) ; said first and second opening overlapping at least in part; and a field electron emission film (1) formed at least on said cathode (2) exposed in the opening, wherein an electron film wherein the comprises a carbon nanotube structural body of 0.001 to 40% by weight (Column 7, lines 30-35) and a heat-decomposable metal compound dispersed therein (Column 7, lines 30-35) *(Prior art reveals, Column 7, lines 5-15, reveal acetates which can be used and Column 60-65 illustrate ethyl groups which can be use, applicants attentions if further drawn to pages 15 and 16 of the applicants disclosure that discloses the various compounds which are named in this reference).*

wherein, said ink is coated and sintered on said surface of said electron substrate, said heat-decomposable metal compound in said ink is decomposed to a heat decomposition product by sintering said heat decomposition product having an adhesive characteristic imparted by said sintering, (Examiner note: this portion of the claim is drawn to a process of coating the emission film onto a substrate and does not delineate any further structural limitations beyond which has been claimed, this portion of the claim will not be afforded patentable weight.

Amey is silent regarding said field electron film has a surface roughness of 1500nm or less.

In the same field of endeavor of field emission devices, Debe teaches wherein said field electron film has a surface roughness of 1500nm or less (Column 2, lines 65-Column 3, lines 3 and Column 4, lines 15-25) *(Examiner note: surface roughness deal with peak to valley values, as the electron film is over the entire cathode, Deb teaches*

the microstructures not be 500nm or more therefore this limitation is met) in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed (Column 6, lines 5-11).

Therefore one of ordinary skill in the art at the time of the invention, could modify the field electron device of Amey wherein said field electron film has a surface roughness of 1500nm or less in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed as taught by Debe.

Regarding claim 12, Amey teaches field electron emission display device comprising: a cathode panel (2) having a field electron emission electrode (1) disposed thereon; and an anode panel (6) having a fluorescent layer (8) and an anode (7) disposed thereon, the both panels being bonded at the individual circumferential portions thereof, and; a field electron emission film (1) on said cathode panel (2), wherein said field electron emission film wherein the electron film comprises a carbon nanotube structural body of 0.001 to 40% by weight (Column 7, lines 30-35) and a heat-decomposable metal compound dispersed therein (Column 7, lines 30-35) *(Prior art reveals, Column 7, lines 5-15, reveal acetates which can be used and Column 60-65 illustrate ethyl groups which can be use, applicants attentions if further drawn to*

pages 15 and 16 of the applicants disclosure that discloses the various compounds which are named in this reference).

wherein, said ink is coated and sintered on said surface of said electron substrate, said heat-decomposable metal compound in said ink is decomposed to a heat decomposition product by sintering said heat decomposition product having an adhesive characteristic imparted by said sintering. (Examiner note: this portion of the claim is drawn to a process of coating the emission film onto a substrate and does not delineate any further structural limitations beyond which has been claimed, this portion of the claim will not be afforded patentable weight.

Amey does not explicitly teach a plurality of emission electrodes nor the anode panel and cathode panel being seal at the circumferential edge. However one of ordinary skill in the art would be able to make a display with a plurality of field emission electrodes in order to render a full color device and to seal the panels together at the edge while applying the teachings of Amey to produce an electron emission film in order to provide a low voltage display with improved electron emission.

Amey is silent regarding said field electron film has a surface roughness of 1500nm or less.

In the same field of endeavor of field emission devices, Debe teaches wherein said field electron film has a surface roughness of 1500nm or less (Column 2, lines 65-Column 3, lines 3 and Column 4, lines 15-25) in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at

lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed (Column 6, lines 5-11).

Therefore one of ordinary skill in the art at the time of the invention, could modify the field electron device of Amey wherein said field electron film has a surface roughness of 1500nm or less in order to provide a device that gives spatially averaged emission levels which are stochastically uniform from pixel to pixel at lower voltages than the prior art; because of the large number of emitting sites per unit area, lower current densities per emission site are allowed as taught by Debe.

8. Claim 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amey, Jr. et al. (US 6,409,567).in view of Debe (US 5,726,524) as applied to claim 1,10 and 11 and in further view of Glatkowski (US 2003/0122111 A1).

Amey as modified by Debe teaches the field emitter film set forth above (see rejection claim 1). Amey as modified by Debe is silent regarding wherein said heat decomposition product is composed of a plurality of metals (claim 6); the plurality of metals are Sn and at least one metal selected from In and Sb (claim 7)

In the same field of endeavor of field emission devices, Glatkowski teaches wherein said heat decomposition product is composed of a plurality of metals (Paragraph 61, lines 5-8 and lines 11-15) (*prior art teaches antimony-tin mixed oxide, tin-indium mixed oxide)* in order to provide a device with lower drive voltage and lower fabrication costs (Paragraph 17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the field emission film of Amey wherein said heat

decomposition product is composed of a plurality of metals in order to provide a device with lower drive voltage and lower fabrication costs as taught by Glatkowski.

Allowable Subject Matter

9. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Prior art fails to teach or suggest " plurality of metals are Sn and In, and the ratio of Sn to In is at 6 % or more."

Response to Arguments

10. Applicant's arguments with respect to claims 6-8 have been considered but are moot in view of the new ground(s) of rejection.

11. Applicant's arguments filed 05/05/09 have been fully considered but they are not persuasive. Specifically, the applicant argues the frit compound is not compatible with the heat decomposable claim and that the secondary reference does not teach a surface roughness of 1500nm over an entire surface of the electrode film.

The examiner respectfully disagrees with the applicant and draws applicants attention again to column 7 of the Amey, as applicant stated in previous rejection and more clearly in this one, the examiner pointed to the frit material only to show they film has an adhesive property, the frit material as cited before and again in this rejection, has frit material mixed with an organic-metallic compound along with a solvent. While fit material alone may be volatile, applicant in drawing a conclusion must take into account the column as a whole. As for the second reference of Debey not teaching a surface

roughness. Surface roughness is discontinuities with in the upper portion of which there are depressions or valleys and then peaks, this is taught in the Debey reference as cited by the examiner in the previous rejection and in this one. Further the applicant argues that Debey does not say entire surface but fails to acknowledge that the figures show an entire film. Furthermore nowhere in the claims has the applicant stated that the surface roughness is across the entire surface, even though the examiner believes if this is added it does not render it patentably distinct from the references as cited. No other claims discussed rejections remain the same.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracie Green whose telephone number is (571)270-3104. The examiner can normally be reached on Mon-Thurs 7:00am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

/Tracie Green/
Examiner, Art Unit 2879

/Sikha Roy/
Primary Examiner, Art Unit 2879